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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,629	06/23/2005	Yuichi Tokita	S1459.70075US00	5380
23628	7590	04/07/2006	EXAMINER	
WOLF GREENFIELD & SACKS, PC FEDERAL RESERVE PLAZA 600 ATLANTIC AVENUE BOSTON, MA 02210-2206			DIAMOND, ALAN D	
			ART UNIT	PAPER NUMBER
			1753	

DATE MAILED: 04/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/540,629

Applicant(s)

TOKITA ET AL.

Examiner

Alan Diamond

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>06232005</u> and <u>12022005</u> | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Drawings

1. The drawings are objected to because drawing sheet No. 3 is just a description of the reference numbers, and should not be a drawing sheet. It is suggested that Applicant amend the specification to recite the description of reference numerals in said sheet No. 3, and then delete said sheet No. 3 from the drawing pages. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: In the Brief Description of the Drawings at page 11, the sentence starting with "Fig. 2" at line 19 should start a new paragraph. Likewise, the sentence starting with "Fig. 3" at line 23 on page 19 should also start a new paragraph. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 6 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 6, at line 3, the term "anatase type" is indefinite because it is not clear how close to being anatase the titania crystal must be in order to be considered "anatase type". It is suggested that "type" be deleted from said term.

Claim 11 is indefinite because it does not set forth a positive process step. It is suggested that "using" at line 3 be changed to "providing"; the word "having" at line 5 be changed to "retaining", and then the word "retained" at line 5 be deleted.

Claim Rejections - 35 USC § 102/103

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1 and 4-11 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Uchida et al, "Application of Titania Nanotubes to a Dye-Sensitized Solar Cell," *Electrochemistry*, June 2002, Vol. 70, No 6, pages 418-420.

Uchida et al prepares a dye-sensitized solar cell comprising a semiconductor layer containing titania nanotubes that are sensitized with a ruthenium dye (see the Experimental section bridging pages 418 and 419). Uchida et al soaks the titania nanotubes (which are coated on a glass substrate) in an ethanol solution of ruthenium dye for 20 hr at room temperature to prepare the dye-sensitized titania nanotubes (see page 219). It is the Examiner's position that this inherently results in the dye being "retained" by the nanotubes. It is also the Examiner's position that the titania used by Uchida et al, i.e. the titania from Kasuga (see the second line of the Experimental section of Uchida et al), is anatase. It is also the Examiner's position that the particles of ruthenium dye do not "associate" with each other. The titania has a particle size of 30 nm (see the Experimental section). The solar cell prepared has the instant substrates (see the Experimental section). Since Uchida et al teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the instant retaining of the dye by the titania nanotubes would obviously have been present once Uchida et al's dye-sensitized solar cell has been provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

8. Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al, "Application of Titania Nanotubes to a Dye-Sensitized Solar Cell," *Electrochemistry*, June 2002, Vol. 70, No 6, pages 418-420 in view of Wariishi et al (U.S. Patent 6,376,765) and Yoshikawa (U.S. Patent 6,586,670).

Uchida et al prepares a dye-sensitized solar cell comprising a semiconductor layer containing titania nanotubes that are sensitized with a ruthenium dye (see the Experimental section bridging pages 418 and 419). Uchida et al soaks the titania nanotubes (which are coated on a glass substrate) in an ethanol solution of ruthenium dye for 20 hr at room temperature to prepare the dye-sensitized titania nanotubes (see page 219). It is the Examiner's position that this inherently results in the dye being "retained" by the nanotubes. It is also the Examiner's position that the titania used by Uchida et al, i.e. the titania from Kasuga (see the second line of the Experimental section of Uchida et al), is anatase. It is also the Examiner's position that the particles of ruthenium dye do not "associate" with each other. The titania has a particle size of 30 nm (see the Experimental section). The solar cell prepared has the instant substrates (see the Experimental section). Uchida et al teaches the limitations of the instant claims, other than the difference which is discussed below.

With respect to claim 2, Uchida et al does not specifically teach that its sensitizing dye has no acidic groups. With respect to claim 3, Uchida et al does not specifically teach using at least two kinds of sensitizing dyes. Wariishi et al teaches dyes that can be used in dye-sensitized solar cells (see col. 26, lines 56 through col. 54). Many dyes, such as dyes S-1, S-3 to S-20, S-22, S-23, S-27 to S-29, S-33, S-37 and S-41, among the dyes illustrated by Wariishi et al do not contain acidic groups (see col. 47 through col. 52). Wariishi et al also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 26, lines 59-62). Yoshikawa also teaches dyes that can be used in dye-sensitized solar cells, such as dye M-1 at col. 24, which does not contain acidic groups. Yoshikawa also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 20, lines 62-66). Yoshikawa teaches that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association (see col. 13, lines 42-49). Thus, even if there was association of dyes, a skilled artisan would know how to weaken this interaction so that there is essentially no association. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a dye that has no acidic groups as the sensitizing dye in Uchida et al's dye-sensitized solar cell because such dyes are conventional in the art, as shown by Wariishi et al and Yoshikawa. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used mixtures of dyes in Uchida et al's dye-sensitized solar cell because, with

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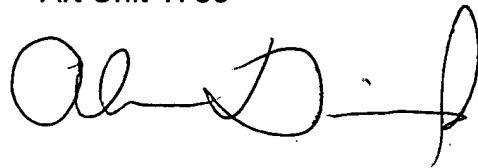
mixtures of dyes, a large photoelectric conversion region and a high photoelectric conversion efficiency can be obtained, as shown by Wariishi et al and Yoshikawa. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have prevented association of the dyes in Uchida et al's dye-sensitized solar cell because it is known in the art that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association, as taught by Yoshikawa.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
Primary Examiner
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A handwritten signature in black ink, appearing to read 'Alan Diamond', with a stylized flourish at the end.

Alan Diamond
April 5, 2006